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October 4, 2002

Docket Nos. 50-321
50-366

HL-6303

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Edwin I. Hatch Nuclear Plant
Third 10-Year Interval Inservice Inspection Program,
Response to Request for Additional Information (RAI)

Ladies and Gentlemen:

By letter dated January 18, 2002, Southern Nuclear Operating Company (SNC) submitted an additional Third 10-Year Interval Inservice Inspection (ISI) Program Request for Relief, (i.e., RR-36). On September 5, 2002, the NRC staff requested additional information required to complete their review of relief request RR-36.

Relief Request RR-36 is related to the qualification requirements for examination of weld overlays in accordance with the ASME Section XI Code, Appendix VIII, Supplement 11. Since this issue affects other BWR plants with weld overlays, the Electric Power Research Institute (EPRI) assisted SNC with review of the NRC RAI and subsequent development of appropriate responses for each question by coordinating with appropriate Performance Demonstration Initiative (PDI) representatives. EPRI informed SNC that the responses provided were developed during a discussion between PDI, NRC, and Pacific Northwest National Laboratory (PNNL) representatives on July 19, 2002. Individuals involved in the discussions included; Carl Latiolais (PDI), Mike Gothard (PDI), Don Naujock (NRC), Steve Doctor (PNNL), and Mike Anderson (PNNL).

Enclosure 1 to this letter contains the NRC RAI and the SNC response. Attachment 1 is a copy of the PDI response to an advance copy of the NRC RAI that was the subject of the above described July 19, 2002, discussion. Attachment 2 is a copy of the revised Appendix VIII, Supplement 11 comparison to the PDI Alternative which resulted from the same July 19, 2002, discussion. Attachments 1 and 2 provide additional information that may be of use by the NRC staff.

Should you have any questions, please contact this office.

Respectfully submitted

A handwritten signature in black ink that reads "Lewis Sumner". The signature is written in a cursive, flowing style.

H. L. Sumner, Jr.

IFL/eb

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U.S. Nuclear Regulatory Commission
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Enclosure: Response to the NRC Request for Additional Information for ISI Request for Relief RR-36

Attachments:

1. PDI response to an advance copy of the NRC RAI
2. Revised Appendix VIII, Supplement 11 Comparison to the PDI Alternative

cc: Southern Nuclear Operating Company
Mr. P. H. Wells, Nuclear Plant General Manager
SNC Document Services (R-Type A02.001)

U.S. Nuclear Regulatory Commission, Washington, D.C.
Mr. Joseph Colaccino, Project Manager - Hatch

U.S. Nuclear Regulatory Commission, Region II
Mr. L. A. Reyes, Regional Administrator
Mr. J. T. Munday, Senior Resident Inspector – Hatch

Enclosure

**Edwin I. Hatch Nuclear Plant, Units 1 and 2
Response to Request for Additional Information (RAI)
ISI Relief Request RR-36**

Enclosure

Edwin I. Hatch Nuclear Plant, Units 1 and 2 Response to Request for Additional Information (RAI) ISI Relief Request RR-36

1. INTRODUCTION

By letter dated January 18, 2002, Southern Nuclear Operating Company (SNC) submitted ISI Relief Request RR-36, proposing an alternative to certain requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, *Rules for Inservice Inspection of Nuclear Power Plant Components*. This request is for the third 10-year inservice inspection (ISI) interval at Hatch Nuclear Plant, Units 1 and 2. Pacific Northwest National Laboratory (PNNL) reviewed the information submitted by the licensee, and based on this review, determined the following information is required to complete the evaluation.

2. REQUEST FOR ADDITIONAL INFORMATION

2.1 Request for Relief RR-36, Examination Category B-J, Pressure Retaining Welds in Piping subject to ASME Section XI, Appendix VIII, Supplement 1, Weld Overlay Qualification Requirements

Performance demonstration requirements for qualifying procedures, personnel and equipment to inspect austenitic piping welds having structural overlays are listed in ASME Section XI, Appendix VIII, Supplement 11. Pursuant to 10 CFR 50.55a(a)(3)(i), the licensee is proposing to use the industry Performance Demonstration Initiative (PDI) program in lieu of Code requirements for inspections of Class 1 piping weld overlays. The licensee stated that PDI is consistent with ASME XI, Appendix VIII, Supplement 11 requirements, except for the alternatives to the specific paragraphs shown below:

- Paragraph 1.1(d)(1) requires that all base metal flaws be cracks.
- Paragraph 1.1(e)(1) requires that at least 20% but not less than 40% of the flaws shall be oriented within ± 20 degrees of the pipe axial direction and that the rules of IWA-3300 shall be used to determine whether closely spaced flaws should be treated as single or multiple flaws.
- Paragraph 1.1(e)(2)(a)(1) requires that a base grading unit shall include at least 3 inches of the length of the overlaid weld and the outer 25% of the overlaid weld and base metal on both sides.
- Paragraph 1.1(e)(2)(a)(3) requires that for unflawed base grading units, at least 1 inch of unflawed overlaid weld and base metal shall exist on either side of the base grading unit.

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Response to the NRC Request for Additional Information
For IST Request for Relief RR-36

- Paragraph 1.1(e)(2)(b)(1) requires that an overlay grading unit shall include the overlay material and the base metal-to-overlay interface of at least 6 square inches. The overlay grading unit shall be rectangular, with minimum dimensions of 2 inches.
- Paragraph 3.2(b) requires that all extensions of base metal cracking into the overlay material by at least 0.1 inch are reported as being intrusions into the overlay material.

However, based on the enclosure submitted by the licensee, PNNL has noted several other related discrepancies between current Supplement 11 requirements and the PDI program for welded overlay qualification. Please respond to the following issues/questions regarding the PDI program.

Item 1

- 2.1(a) Item 1.1 (b) -- This item concerns the maximum thickness for which a procedure may be qualified. The Appendix VIII position is that qualification for the range of overlay thickness is valid when at least one specimen is used whose overlay thickness is within -0.10 inch to +0.25 inch of the maximum nominal overlay thickness for which the procedure is applicable. The PDI program implies that qualification may be performed on any specimens that are greater than -0.25 inches of the maximum overlay for the procedure. This appears to be a relaxation of requirements. Please provide a justification.

SNC Response

The Performance Demonstration Initiative (PDI) informed SNC that discussions were held between NRC and PDI representatives on 07/19/02. These discussions resulted in the following change to the proposed PDI Program alternative.

The specimen set shall include specimens with overlays not thicker than 0.1 in. more than the minimum thickness, nor thinner than 0.25 in. of the maximum nominal overlay thickness for which the examination procedure is applicable.

Discussion

PDI explained that it was always the intent to provide an allowance to examine overlays that were slightly larger than the maximum that was qualified. PDI also explained that the Appendix VIII Committee concluded that 0.25 inch was adequate and any deviation greater than that would require additional qualification. Therefore, SNC agrees with the information provided by PDI and the proposed change to the PDI Program alternative.

Item 2

- 2.1(b) Item 1.1 (d) (1) (a) -- In Appendix VIII, it is stated that all flaws must be cracks and IGSCC when available. In Code Case N-653 there is an opportunity to use alternative flaws when implantation of cracks precludes obtaining a **realistic** UT response. It is unclear what a "realistic" UT response may encompass. Also, in the PDI program, the

wording has been changed to “precludes obtaining an **effective** UT response”. This is also unclear. Please provide the actions you propose to implement in this area.

SNC Response

PDI informed SNC that discussions were held between NRC and PDI representatives on 07/19/02. PDI stated that the use of “effective” was unintentional and the below clarification has been made to the PDI Program alternative.

(a) Flaws shall be limited to the cases where implantation of cracks **produces spurious reflectors that are uncharacteristic of actual flaws.**

SNC agrees with the response provided by PDI and the subsequent change made to the PDI Program alternative.

Item 3

2.1(c) Items 1.1 (e)(2)(a)(1) and (b)(1) – The PDI program states that grading units must be at least 1 in. There needs to be additional clarification as to the directions of the length and width of the grading units and whether they will all be the same size.

SNC Response

PDI informed SNC that discussions were held between NRC and PDI representatives on 07/19/02. PDI also stated that the below clarification has been made to the PDI Program alternative.

(a)(1) The base metal grading unit includes the outer 25% of the overlaid weld and extends circumferentially for at least 1 in. The grading unit shall start at the weld centerline and shall be wide enough in the axial direction to encompass one half of the original weld crown and a minimum of 0.50” of the adjacent base material. The base metal grading unit shall not include the inner 75% of the overlaid weld and base metal overlay material, or base metal-to-overlay interface.

PDI explained that base material flaws are located in the base material contained within the original weld heat affected zone. Because the width of the weld crown and heat affected zone vary from pipe to pipe, latitude must be given in the Code to allow the user to vary the width of the grading units. The PDI therefore concluded that the words provided above allow sufficient latitude. SNC agrees with the PDI response and the clarification changes made to the PDI Program alternative.

Item 4

2.1(d) Item 2.3 – The candidate shall determine the maximum depth of the flaw in each grading unit, as stated in both the Code Case and the PDI program. It is not clear as to what the candidate must do. The term grading unit has been associated with some surface area.

Will the candidate be provided with a template and told to size the largest flaw in a surface area? Or in a volume? Clarification is required.

SNC Response

PDI informed SNC that discussions were held between NRC and PDI representatives on 07/19/02. PDI also stated that the below clarification has been made to the PDI Program alternative.

2.3 Depth Sizing Test

(a) The depth sizing test may be conducted separately or in conjunction with the detection test.

(b) When the depth sizing test is conducted in conjunction with the detection test and the detected flaws do not satisfy the requirements of 1.1(f), additional specimens shall be provided to the candidate. The regions containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the maximum depth of the flaw in each region.

(c) For a separate depth sizing test, the regions of each specimen containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the maximum depth of the flaw in each region.

PDI stated that grading units are not associated with length or depth sizing. Candidates are instructed to find the maximum flaw height in a specific region of the sample. The region is large enough to encompass the flaw to be sized but small enough that they do not size the wrong flaw. SNC agrees with PDI's response and the clarification added to the PDI Program alternative.

Item 5

2.1(e) Item 3.1 – Appendix VIII calls for procedures, personnel and equipment to meet the acceptance criteria in Table VIII-S2-1 for both detection and false calls. The Code Case and the PDI program break-out procedure qualification separately and state that all flaws must be detected (by each inspector or in sum for all those qualifying the procedure) and must satisfy the acceptance criteria of Table VIII-S2-1 for false calls. This is unclear and very ambiguous. Does each inspector have to pass the detection test? How many inspectors are needed to qualify a procedure? How many test sets must be inspected and to what level of performance? Why is this wording different than the wording for the draft code case (BC01-150, ISI 01-03) Supplement 4, 1.0(g) "For initial procedure qualification, the detection set shall include the equivalent of three personnel qualification sets, (and the performance demonstration must detect all flaws and not exceed the false calls in Table VIII-S2-1.) To qualify new values of essential variables, at least one personnel qualification set is required."

SNC Response

PDI informed SNC that discussions were held between NRC and PDI representatives on 07/19/02. PDI also stated that the below clarification has been made to the PDI Program alternative.

Detection Acceptance Criteria

- (a) Examination procedures are qualified for detection when;**
- (1) All flaws within the scope of the procedure are detected and the results of the performance demonstration satisfy the acceptance criteria of Table VIII-S2-1 for false calls.**
 - (2) At least one successful personnel demonstration has been performed meeting the acceptance criteria defined in (b).**
- (b) Examination equipment and personnel are qualified for detection when the results of the performance demonstration satisfy the acceptance criteria of Table VIII-S2-1 for both detection and false calls.**
- (c) The criteria in (a), (b) shall be satisfied separately by the demonstration results for base metal grading units and for overlay fabrication grading units.**

Discussion

The 3X procedure qualification requirements identified above are in addition to the Code and a Request for Relief is not required for its use. Except as noted elsewhere in the request for relief (e.g., alternative flaws, etc.), the proposed PDI Program alternative for personnel and equipment qualifications is identical to and in full compliance with the current Code requirements for procedures, personnel and equipment.

The PDI Program includes additional requirements for procedure qualification. Simply stated, the procedure must be exercised on 3 times as many flaws as currently required by the Code and each flaw must be detected. Except for the false call provisions, no further requirements are intended. SNC agrees with the PDI response and the clarification made to the PDI Program alternative.

Item 6

- 2.1(f) Item 3.2 (a) The RMS error of the flaw length measurements, as compared to the true flaw lengths, is less than or equal to 0.75 in.” With the minimum grading unit length being 1.0 inch circumferential, examiners could potentially use this information to satisfy the length sizing criteria, i.e. for a 1.0 inch circumferential grading unit, a sized length of 0.5 inch will always satisfy the RMS no matter what the true length. Please explain how this will be avoided.

SNC Response

PDI informed SNC that discussions were held between NRC and PDI representatives on 07/19/02. PDI also stated that the below clarification has been made to the PDI Program alternative.

(1.1)(f)(1) Sizing Specimens

- (1) The minimum number of flaws shall be ten. At least 30% of the flaws shall be overlay fabrication flaws. At least 40% of the flaws **shall be open** to the inside surface. **The size of the flaws in the tests sets shall have a sufficient range of sizes to assess sizing capability.** For initial procedure qualification, sizing sets shall include the equivalent of three personnel qualification sets. To qualify new values of essential variables, at least one personnel qualification set is required.

Discussion

Grading units are not associated with length or depth sizing. Flawed grading units are a minimum of one inch, but the flaw can be shorter than the size of the grading unit. For flaws greater than one inch the grading unit includes the entire flaw. The examination contains many flaws greater than 3 or 4 inches long. The inclusion of too much detail on the minimum and maximum size of the flaws could encourage testmanship, not stop it. SNC agrees with the PDI response and the clarification made to the PDI Program alternative.

Attachment 1

**Edwin I. Hatch Nuclear Plant, Units 1 and 2
Response to Request for Additional Information (RAI)
ISI Relief Request RR-36**

PDI Response to an Advance Copy of the NRC RAI

Attachment 1

Edwin I. Hatch Nuclear Plant, Units 1 and 2 Response to Request for Additional Information (RAI) ISI Relief Request RR-36

PDI Response to an Advance Copy of the NRC RAI

This document provides a brief summary of issues raised during a NRC/PNNL review of SNC ISI Program Relief Request RR 36 concerning use of the PDI program for Supplement 11. The issues were discussed with NRC/PNL and PDI personnel during a telecon on 07/19/02. A PDI response to each issue is provided. When appropriate, changes to the proposed PDI Program alternative (column 3) in the attached, will be presented for inclusion in Code case N-653-1.

Question 1:

Item 1.1 (b) -- concerning the maximum thickness that the procedure is qualified: The Appendix VIII position is that this must be done between the maximum in the procedure up to 0.25 inch above the maximum. The PDI position is that it must be done to anything that is greater than -- 0.25 inches of the maximum in the procedure. This looks like a relaxation of requirements so what is the justification?

PDI Response:

Per discussion on 07/19/02, the proposed PDI Program alternative (column 3) has been clarified as follows:

The specimen set shall include specimens with overlays not thicker than 0.1 in. more than the minimum thickness, nor thinner than 0.25 in. of the maximum nominal overlay thickness for which the examination procedure is applicable.

Discussion:

It was always the intent to provide an allowance to examine overlays that were slightly larger than the maximum that was qualified. It was the opinion of the Code Committee that 0.25 inch was adequate and any deviation greater than that would require additional qualification.

Question 2:

Item 1.1 (d) (1) (a) -- In Appendix VIII the words are that all flaws must be cracks and IGSCC when available. In the Code Case N-653 there is the opportunity to use alternative flaws and when implantation of cracks precludes obtaining a realistic UT response is unclear. What does this mean? In the PDI program the words are precludes obtaining an effective UT response. What does this mean?

PDI Response

The use of "effective" was unintentional. Per discussion on 07/19/02, the following clarification was made to the proposed PDI Program alternative:

- (a) Flaws shall be limited to the cases where ~~when~~ implantation of cracks produces spurious reflectors that are uncharacteristic of actual flaws.

Discussion:

None

Question 3:

Items 1.1 (e)(2)(a)(1) and (b)(1) – It states that the grading units must be at least 1 in. There needs to be some additional clarification as to the directions of the length and width of the grading units and must they all be the same size? (i. e. at least 1" circumferential and half the weld width plus X.X base material surface or some inspection volume width. Grading units are ??? Within each specimen and may be different between specimens).

PDI Response

Per discussion on 07/19/02, the proposed PDI Program alternative (column 3) has been clarified as follows:

- (a)(1)A base metal grading unit includes the overlay material and the outer 25% of the original overlaid weld. The base metal grading unit shall extend circumferentially for at least 1 in. and shall start at the weld centerline and be wide enough in the axial direction to encompass one half of the original weld crown and a minimum of 0.50" of the adjacent base material.

Discussion:

Base material flaws are located in the base material contained within the original weld heat affected zone. Because the width of the weld crown and heat affected zone vary from pipe to pipe, latitude must be given in the code to allow the user to vary the width of the grading units. PDI feels that the words provided above allow sufficient latitude.

Question 4:

Item 2.3 – The candidate shall determine the maximum depth of the flaw in each grading unit, as stated in both the Code Case and the PDI Program. It is not clear as to what the candidate must do. The term grading unit has been associated with some surface area. Are they being provided with a template and told to size the largest flaw in a surface area? Or in a volume? Clarification is needed.

PDI Response:

Per discussion on 07/19/02, the proposed PDI Program alternative (column 3) has been clarified as follows:

2.3 Depth Sizing Test

(a) The depth sizing test may be conducted separately or in conjunction with the detection test.

(b) When the depth sizing test is conducted in conjunction with the detection test and the detected flaws do not satisfy the requirements of 1.1(f), additional specimens shall be provided to the candidate. The regions containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the maximum depth of the flaw in each region.

(c) For a separate depth sizing test, the regions of each specimen containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the maximum depth of the flaw in each region.

Discussion:

Grading units are not associated with length or depth sizing. Candidates are instructed to find the maximum flaw height in a specific region of the sample. The region is large enough to encompass the flaw to be sized but small enough that they do not size the wrong flaw.

Question 5:

Item 3.1 – The Appendix VIII Code calls for procedures, personnel and equipment to meet the acceptance criteria in Table VIII-S2-1 for both detection and false calls. The Code Case and the PDI Program split out procedures and they state that all flaws must be detected (by each inspector or in sum for all those qualifying the procedure) and must satisfy the acceptance criteria of Table VIII-S2-1 for false calls. This is very ambiguous. Does each inspector have to pass the detection test? How many inspectors are needed to qualify a procedure? How many test sets must be inspected and to what level of performance? Why is this wording different than the wording for the draft code case (BC01-150, ISI 01-03) Supplement 4, 1.0(g) “For initial procedure qualification, the detection set shall include the equivalent of three personnel qualification sets, (and the performance demonstration must detect all flaws and not exceed the false calls in Table VIII-S2-1.) To qualify new values of essential variables, at least one personnel qualification set is required.”

PDI Response:

Per discussion on 07/19/02, the proposed PDI Program alternative (column 3) has been clarified as follows:

3.1 Detection Acceptance Criteria

- a) Examination procedures are qualified for detection when;
- (1) All flaws within the scope of the procedure are detected and the results of the performance demonstration satisfy the acceptance criteria of Table VIII-S2-1 for false calls.
 - (2) At least one successful personnel demonstration has been performed meeting the acceptance criteria defined in (b).
- b) Examination equipment and personnel are qualified for detection when the results of the performance demonstration satisfy the acceptance criteria of Table VIII-S2-1 for both detection and false calls.
- (c) The criteria in (a), (b) shall be satisfied separately by the demonstration results for base metal grading units and for overlay fabrication grading units.

Discussion:

The 3X procedure qualification requirements identified above are in addition to the Code and a Request for Relief is not required for its use. Except as noted elsewhere in the request for relief (e.g., alternative flaws, etc.), the proposed PDI Program alternative for personnel and equipment qualifications is identical to and in full compliance with the current Code requirements for procedures, personnel and equipment.

In response to your questions, the PDI Program includes additional requirements for procedure qualification. Simply stated, the procedure must be exercised on 3 times as many flaws as currently required by the Code and each flaw must be detected. Except for the false call provisions, no further requirements are intended. We will be glad to resolve any issues regarding this during the N-653 revision process if the proposed resolution is not sufficient.

Question 6:

Item 3.2 (a) The RMS error of the flaw length measurements, as compared to the true flaw lengths, is less than or equal to 0.75in. With the minimum grading unit length 1.0" circumferential, examiners can use testmanship to satisfy the length sizing criteria, i.e. for a 1.0" circumferential grading unit, a length of 0.5" will always satisfy the RMS no matter what the true length.

Attachment 1
Response to Request for Additional Information (RAI)
ISI Relief Request RR-36
PDI response to an advance copy of the NRC RAI

Response:

Per discussion on 07/19/02, the proposed PDI Program alternative (column 3) has been clarified as follows:

(1.1)(f)(1) Sizing Specimens

- (3) The minimum number of flaws shall be ten. At least 30% of the flaws shall be overlay fabrication flaws. At least 40% of the flaws **shall be open** to the inside surface. **Sizing sets shall contain a distribution of flaw dimensions to assess sizing capabilities.** For initial procedure qualification, sizing sets shall include the equivalent of three personnel qualification sets. To qualify new values of essential variables, at least one personnel qualification set is required.

Discussion:

Grading units are not associated with length or depth sizing. Flawed grading units are a minimum of one inch, but the flaw can be shorter than the size of the grading unit. For flaws greater than one inch, the grading unit includes the entire flaw. The examination contains many flaws greater than 3 or 4 inches long. The inclusion of too much detail on the minimum and maximum size of the flaws could encourage testmanship, not stop it.

Attachment 2

**Edwin I. Hatch Nuclear Plant, Units 1 and 2
Response to Request for Additional Information (RAI)
ISI Relief Request RR-36**

Revised Appendix VIII, Supplement 11 Comparison to the PDI Alternative

Revised Appendix VIII, Supplement 11 Comparison to the PDI Alternative		
SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS	CODE CASE N-653 (Provided for Information Only)	PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements
1.0 SPECIMEN REQUIREMENTS		
Qualification test specimens shall meet the requirements listed herein, unless a set of specimens is designed to accommodate specific limitations stated in the scope of the examination procedure (e.g., pipe size, weld joint configuration, access limitations). The same specimens may be used to demonstrate both detection and sizing qualification.	No Change	No Change
1.1 General The specimen set shall conform to the following requirements.	No Change	No Change
(a) Specimens shall have sufficient volume to minimize spurious reflections that may interfere with the interpretation process.	No Change	No Change
(b) The specimen set shall consist of at least three specimens having different nominal pipe diameters and overlay thicknesses. They shall include the minimum and maximum nominal pipe diameters for which the examination procedure is applicable. Pipe diameters within a range of 0.9 to 1.5 times a nominal diameter shall be considered equivalent. If the procedure is applicable to pipe diameters of 24 in. or larger, the specimen set must include at least one specimen 24 in. or larger but need not include the maximum diameter. The specimen set must include at least one specimen with overlay thickness within -0.1 in. to +0.25 in. of the maximum nominal overlay thickness for which the procedure is applicable.	No Change	(b) The specimen set shall consist of at least three specimens having different nominal pipe diameters and overlay thicknesses. They shall include the minimum and maximum nominal pipe diameters for which the examination procedure is applicable. Pipe diameters within a range of 0.9 to 1.5 times a nominal diameter shall be considered equivalent. If the procedure is applicable to pipe diameters of 24 in. or larger, the specimen set must include at least one specimen 24 in. or larger but need not include the maximum diameter. The specimen set shall include specimens with overlays not thicker than 0.1 in. more than the minimum thickness, nor thinner than 0.25 in. of the maximum nominal overlay thickness for

Revised Appendix VIII, Supplement 11 Comparison to the PDI Alternative		
SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS	CODE CASE N-653 (Provided for Information Only)	PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements
		which the examination procedure is applicable.
(c) The surface condition of at least two specimens shall approximate the roughest surface condition for which the examination procedure is applicable.	No Change	No Change
(d) Flaw Conditions		
(1) Base metal flaws. All flaws must be cracks in or near the butt weld heat-affected zone, open to the inside surface, and extending at least 75% through the base metal wall. Flaws may extend 100% through the base metal and into the overlay material; in this case, intentional overlay fabrication flaws shall not interfere with ultrasonic detection or characterization of the cracking. Specimens containing IGSCC shall be used when available.	<p>(1) Base metal flaws. All flaws must be in or near the butt weld heat-affected zone, open to the inside surface, and extending at least 75% through the base metal wall. Intentional overlay fabrication flaws shall not interfere with ultrasonic detection or characterization of the cracking. Specimens containing IGSCC shall be used when available. At least 70 percent of the flaws in the detection and sizing tests shall be cracks. Alternative flaw mechanisms, if used, shall provide crack-like reflective characteristics and shall be limited by the following:</p> <p>(a) Flaws shall be limited to when implantation of cracks precludes obtaining a realistic ultrasonic response.</p> <p>(b) Flaws shall be semi elliptical with a tip width of less than or equal to 0.002 inches.</p>	<p>(1) Base metal flaws. All flaws must be in or near the butt weld heat-affected zone, open to the inside surface, and extending at least 75% through the base metal wall. Intentional overlay fabrication flaws shall not interfere with ultrasonic detection or characterization of the base metal flaws. Specimens containing IGSCC shall be used when available. At least 70 percent of the flaws in the detection and sizing tests shall be cracks and the remainder shall be alternative flaws. Alternative flaw mechanisms, if used, shall provide crack-like reflective characteristics and shall be limited by the following:</p> <p>(a) The use of Alternative flaws shall be limited to when the implantation of cracks produces spurious reflectors that are uncharacteristic of actual flaws.</p> <p>(b) Flaws shall be semi elliptical with a tip width of less than or equal to 0.002 inches.</p>

Revised Appendix VIII, Supplement 11 Comparison to the PDI Alternative		
SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS	CODE CASE N-653 (Provided for Information Only)	PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements
(2) Overlay fabrication flaws. At least 40% of the flaws shall be non-crack fabrication flaws (e.g., sidewall lack of fusion or laminar lack of bond) in the overlay or the pipe-to-overlay interface. At least 20% of the flaws shall be cracks. The balance of the flaws shall be of either type.	No Change	No Change
(e) Detection Specimens		
(1) At least 20% but less than 40% of the flaws shall be oriented within ± 20 deg. of the pipe axial direction. The remainder shall be oriented circumferentially. Flaws shall not be open to any surface to which the candidate has physical or visual access. The rules of IWA-3300 shall be used to determine whether closely spaced flaws should be treated as single or multiple flaws.	(1) At least 20% but less than 40% of the base metal flaws shall be oriented within ± 20 deg. of the pipe axial direction. The remainder shall be oriented circumferentially. Flaws shall not be open to any surface to which the candidate has physical or visual access.	(1) At least 20% but less than 40% of the base metal flaws shall be oriented within ± 20 deg. of the pipe axial direction. The remainder shall be oriented circumferentially. Flaws shall not be open to any surface to which the candidate has physical or visual access.
(2) Specimens shall be divided into base and overlay grading units. Each specimen shall contain one or both types of grading units.	(2) Specimens shall be divided into base metal and overlay fabrication grading units. Each specimen shall contain one or both types of grading units. Flaws shall not interfere with ultrasonic detection or characterization of other flaws.	(2) Specimens shall be divided into base metal and overlay fabrication grading units. Each specimen shall contain one or both types of grading units. Flaws shall not interfere with ultrasonic detection or characterization of other flaws.
(a)(1) A base grading unit shall include at least 3 in. of the length of the overlaid weld. The base grading unit includes the outer 25% of the overlaid weld and base metal on both sides. The base grading unit shall not include the inner 75% of the overlaid weld and base metal overlay material, or base metal-to-overlay interface.	(a)(1) A base metal grading unit shall include at least 1 in. of the length of the overlaid weld. The base metal grading unit includes the outer 25% of the overlaid weld and base metal on both sides. The base metal grading unit shall not include the inner 75% of the overlaid weld and base metal overlay material, or base metal-to-overlay interface.	(a)(1) A base metal grading unit includes the overlay material and the outer 25% of the original overlaid weld. The base metal grading unit shall extend circumferentially for at least 1 in. and shall start at the weld centerline and be wide enough in the axial direction to encompass one half of the original weld crown and a minimum of 0.50" of the adjacent base material.

Revised Appendix VIII, Supplement 11 Comparison to the PDI Alternative		
SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS	CODE CASE N-653 (Provided for Information Only)	PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements
(a)(2) When base metal cracking penetrates into the overlay material, the base grading unit shall include the overlay metal within 1 in. of the crack location. This portion of the overlay material shall not be used as part of any overlay grading unit.	(a)(2) When base metal cracking penetrates into the overlay material, the base metal grading unit shall not be used as part of any overlay fabrication grading unit.	(a)(2) When base metal flaws penetrate into the overlay material, the base metal grading unit shall not be used as part of any overlay fabrication grading unit.
(a)(3) When a base grading unit is designed to be unflawed, at least 1 in. of unflawed overlaid weld and base metal shall exist on either side of the base grading unit. The segment of weld length used in one base grading unit shall not be used in another base grading unit. Base grading units need not be uniformly spaced around the specimen.	(a)(3) Sufficient unflawed overlaid weld and base metal shall exist on all sides of the grading unit to preclude interfering reflections from adjacent flaws.	(a)(3) Sufficient unflawed overlaid weld and base metal shall exist on all sides of the grading unit to preclude interfering reflections from adjacent flaws.
(b)(1) An overlay grading unit shall include the overlay material and the base metal-to-overlay interface of at least 6 sq. in. The overlay grading unit shall be rectangular, with minimum dimensions of 2 in.	(b)(1) An overlay fabrication grading unit shall include the overlay material and the base metal-to-overlay interface for a length of at least 1 in.	(b)(1) An overlay fabrication grading unit shall include the overlay material and the base metal-to-overlay interface for a length of at least 1 in.
(b)(2) An overlay grading unit designed to be unflawed shall be surrounded by unflawed overlay material and unflawed base metal-to-overlay interface for at least 1 in. around its entire perimeter. The specific area used in one overlay grading unit shall not be used in another overlay grading unit. Overlay grading units need not be spaced uniformly about the specimen.	(b)(2) Overlay fabrication grading units designed to be unflawed shall be separated by unflawed overlay material and unflawed base metal-to-overlay interface for at least 1 in. at both ends. Sufficient unflawed overlaid weld and base metal shall exist on both sides of the overlay fabrication grading unit to preclude interfering reflections from adjacent flaws. The specific area used in one overlay fabrication grading unit shall not be used in another overlay fabrication grading unit. Overlay fabrication grading units need not be spaced uniformly about the specimen.	(b)(2) Overlay fabrication grading units designed to be unflawed shall be separated by unflawed overlay material and unflawed base metal-to-overlay interface for at least 1 in. at both ends. Sufficient unflawed overlaid weld and base metal shall exist on both sides of the overlay fabrication grading unit to preclude interfering reflections from adjacent flaws. The specific area used in one overlay fabrication grading unit shall not be used in another overlay fabrication grading unit. Overlay fabrication grading units need not be spaced uniformly about the specimen.

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(b)(3) Detection sets shall be selected from Table VIII-S2-1. The minimum detection sample set is five flawed base grading units, ten unflawed base grading units, five flawed overlay grading units, and ten unflawed overlay grading units. For each type of grading unit, the set shall contain at least twice as many unflawed as flawed grading units.	(b)(3) Detection sets shall be selected from Table VIII-S2-1. The minimum detection sample set is five flawed base metal grading units, ten unflawed base metal grading units, five flawed overlay fabrication grading units, and ten unflawed overlay fabrication grading units. For each type of grading unit, the set shall contain at least twice as many unflawed as flawed grading units. For initial procedure qualification, detection sets shall include the equivalent of three personnel qualification sets. To qualify new values of essential variables, at least one personnel qualification set is required.	(b)(3) Detection sets shall be selected from Table VIII-S2-1. The minimum detection sample set is five flawed base metal grading units, ten unflawed base metal grading units, five flawed overlay fabrication grading units, and ten unflawed overlay fabrication grading units. For each type of grading unit, the set shall contain at least twice as many unflawed as flawed grading units. For initial procedure qualification, detection sets shall include the equivalent of three personnel qualification sets. To qualify new values of essential variables, at least one personnel qualification set is required.
(f) Sizing Specimen		
(1) The minimum number of flaws shall be ten. At least 30% of the flaws shall be overlay fabrication flaws. At least 40% of the flaws shall be cracks open to the inside surface.	(1) The minimum number of flaws shall be ten. At least 30% of the flaws shall be overlay fabrication flaws. At least 40% of the flaws shall be cracks open to the inside surface. For initial procedure qualification, sizing sets shall include the equivalent of three personnel qualification sets. To qualify new values of essential variables, at least one personnel qualification set is required.	(1) The minimum number of flaws shall be ten. At least 30% of the flaws shall be overlay fabrication flaws. At least 40% of the flaws shall be open to the inside surface. Sizing sets shall contain a distribution of flaw dimensions to assess sizing capabilities. For initial procedure qualification, sizing sets shall include the equivalent of three personnel qualification sets. To qualify new values of essential variables, at least one personnel qualification set is required.
(2) At least 20% but less than 40% of the flaws shall be oriented axially. The remainder shall be oriented circumferentially. Flaws shall not be open to any surface to which the candidate has physical or visual access.	No Change	No Change

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(3) Base metal cracking used for length sizing demonstrations shall be oriented circumferentially.	No Change	(3) Base metal flaws used for length sizing demonstrations shall be oriented circumferentially.
(4) Depth sizing specimen sets shall include at least two distinct locations where cracking in the base metal extends into the overlay material by at least 0.1 in. in the through-wall direction.	No Change	(4) Depth sizing specimen sets shall include at least two distinct locations where a base metal flaw extends into the overlay material by at least 0.1 in. in the through-wall direction.
2.0 CONDUCT OF PERFORMANCE DEMONSTRATION		
The specimen inside surface and identification shall be concealed from the candidate. All examinations shall be completed prior to grading the results and presenting the results to the candidate. Divulgence of particular specimen results or candidate viewing of unmasked specimens after the performance demonstration is prohibited.	The specimen inside surface and identification shall be concealed from the candidate. All examinations shall be completed prior to grading the results and presenting the results to the candidate. Divulgence of particular specimen results or candidate viewing of unmasked specimens after the performance demonstration is prohibited. The overlay fabrication flaw test and the base metal flaw test may be performed separately.	The specimen inside surface and identification shall be concealed from the candidate. All examinations shall be completed prior to grading the results and presenting the results to the candidate. Divulgence of particular specimen results or candidate viewing of unmasked specimens after the performance demonstration is prohibited. The overlay fabrication flaw test and the base metal flaw test may be performed separately.
2.1 Detection Test		
Flawed and unflawed grading units shall be randomly mixed. Although the boundaries of specific grading units shall not be revealed to the candidate, the candidate shall be made aware of the type or types of grading units (base or overlay) that are present for each specimen.	Flawed and unflawed grading units shall be randomly mixed. Although the boundaries of specific grading units shall not be revealed to the candidate, the candidate shall be made aware of the type or types of grading units (base metal or overlay fabrication) that are present for each specimen.	Flawed and unflawed grading units shall be randomly mixed. Although the boundaries of specific grading units shall not be revealed to the candidate, the candidate shall be made aware of the type or types of grading units (base metal or overlay fabrication) that are present for each specimen.

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2.2 Length Sizing Test		
(a) The length sizing test may be conducted separately or in conjunction with the detection test.	No Change	No Change
(b) When the length sizing test is conducted in conjunction with the detection test and the detected flaws do not satisfy the requirements of 1.1(f), additional specimens shall be provided to the candidate. The regions containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the length of the flaw in each region.	No Change	No Change
(c) For a separate length sizing test, the regions of each specimen containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the length of the flaw in each region.	No Change	No Change
(d) For flaws in base grading units, the candidate shall estimate the length of that part of the flaw that is in the outer 25% of the base wall thickness.	(d) For flaws in base metal grading units, the candidate shall estimate the length of that part of the flaw that is in the outer 25% of the base metal wall thickness.	(d) For flaws in base metal grading units, the candidate shall estimate the length of that part of the flaw that is in the outer 25% of the base metal wall thickness.
2.3 Depth Sizing Test		
For the depth sizing test, 80% of the flaws shall be sized at a specific location on the surface of the specimen identified to the candidate. For the remaining flaws, the regions of each specimen containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the maximum depth of the flaw in each region.	The candidate shall determine the depth of the flaw in each region.	(a) The depth sizing test may be conducted separately or in conjunction with the detection test.

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		(b) When the depth sizing test is conducted in conjunction with the detection test and the detected flaws do not satisfy the requirements of 1.1(f), additional specimens shall be provided to the candidate. The regions containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the maximum depth of the flaw in each region.
		(c) For a separate depth sizing test, the regions of each specimen containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the maximum depth of the flaw in each region.
3.0 ACCEPTANCE CRITERIA		
3.1 Detection Acceptance Criteria		
Examination procedures, equipment, and personnel are qualified for detection when the results of the performance demonstration satisfy the acceptance criteria of Table VIII-S2-1 for both detection and false calls. The criteria shall be satisfied separately by the demonstration results for base grading units and for overlay grading units.	Examination procedures are qualified for detection when all flaws within the scope of the procedure are detected and the results of the performance demonstration satisfy the acceptance criteria of Table VIII-S2-1 for false calls. Examination equipment and personnel are qualified for detection when the results of the performance demonstration satisfy the acceptance criteria of Table VIII-S2-1 for both detection and false calls. The criteria shall be satisfied separately by the demonstration results for base metal grading units and for overlay fabrication grading units.	(a) Examination procedures are qualified for detection when;

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		1) All flaws within the scope of the procedure are detected and the results of the performance demonstration satisfy the acceptance criteria of Table VIII-S2-1 for false calls.
		(a) At least one successful personnel demonstration has been performed meeting the acceptance criteria defined in (b).
		(b) Examination equipment and personnel are qualified for detection when the results of the performance demonstration satisfy the acceptance criteria of Table VIII-S2-1 for both detection and false calls.
		(c) The criteria in (a), (b) shall be satisfied separately by the demonstration results for base metal grading units and for overlay fabrication grading units.
3.2 Sizing Acceptance Criteria		
Examination procedures, equipment, and personnel are qualified for sizing when the results of the performance demonstration satisfy the following criteria.	No Change	No Change
(a) The RMS error of the flaw length measurements, as compared to the true flaw lengths, is less than or equal to 0.75 inch. The length of base metal cracking is measured at the 75% through-base-metal position.	No Change	(a) The RMS error of the flaw length measurements, as compared to the true flaw lengths, is less than or equal to 0.75 inch. The length of base metal flaws is measured at the 75% through-base-metal position.
(b) All extensions of base metal cracking into the overlay material by at least 0.1 in. are reported as being intrusions into the overlay material.	This requirement is omitted.	This requirement is omitted.

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(c) The RMS error of the flaw depth measurements, as compared to the true flaw depths, is less than or equal to 0.125 in.	(b) The RMS error of the flaw depth measurements, as compared to the true flaw depths, is less than or equal to 0.125 in.	(b) The RMS error of the flaw depth measurements, as compared to the true flaw depths, is less than or equal to 0.125 in.